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AUTHOR So, Alvin Y.; Chan, Kenyon S.
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ABSTRACT

The cause of the reading achievement gap between language minority students and non-language minority students was examined. Data from the "High School and Beyond" study, a national longitudinal study of 58,000 high school sophmores and seniors, were used. Through the application of regression analysis, it was found that both language background and socioeconomic status (SES) had a substantial and independent impact on reading achievement scores, but SES had more of an impact on Anglo students than on Hispanic students. When the reading gap was further analyzed using Duncan's (1969) statistical technique, it was found that only about half of the reading gap was accounted for by removing the effects of SES and ethnicity. This remaining gap had to be explained by language and other variables. It was concluded that efforts directed only at raising the socioeconomic status of language minority students would not provide an adequate solution to the problem of the reading achievement gap. (Author/RW)

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WHAT MATTERS? THE RELATIVE IMPACT OF LANGUAGE BACKGROUND AND SOCIOECONOMIC STATUS ON READING ACHIEVEMENT

Alvin Y. So and Kenyon S. Chan

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ABSTRACT

The aim of this paper is to examine the cause of the reading achievement gap between language minority students and non-language minority students. Analyzing the intricate relationship among language background, socioeconomic status and ethnicity in the High School and Beyond data set, it was found that both language background and SES have a substantial and independent impact on reading achievement scores, but SES has more of an impact on white students than on Hispanic students. In addition, using Duncan's statistical technique to decompose the reading achievement gap between language minority and non-language minority students, it was found that only about half of the reading gap was accounted for by removing the effects of SES and ethnicity. Therefore, the remaining 50% of the reading gap was a product of language background and other unexplained variables.

WHAT MATTERS? THE RELATIVE IMPACT OF LANGUAGE BACKGROUND AND SOCIOECONOMIC STATUS ON READING ACHIEVEMENT

Alvin Y. So and Kenyon S. Chan

It has been well accepted that language minority students do not perform as well on reading achievement tests as students who are not language minorities. What needs to be further investigated, however, is the cause of this reading achievement gap between the two groups. Is this gap strictly a matter of language background, or is it a matter of the socioeconomic status of language minority students?

The bilingual education literature tends to take the position that language background is the determining factor in reading achievement (see, e.g., Andersson & Boyer, 1978; Gaarder, 1977). The literature maintains that language minority children experience school-related difficulties that depress their academic achievement in the early school years because they do not understand the instruction, which is conducted in English. Consequently, language minority students, unable to communicate with their teachers, are unable to close the gap between them and their English-speaking peers and fall further behind in the later school years. Furthermore, that early frustration establishes a pattern of failure for language minority students which is compounded by the mismatch between their language and that of the school program and its environment. This perspective establishes a direct relationship between the language background of language minority students and their poor academic and reading achievement.

Recently, this language background explanation has been challenged by Rosenthal, Milne, Ginsberg and Baker (1981). Suspecting that there may be hidden effects of socioeconomic deprivation, the authors ran a regression analysis on the Sustaining Effects Study data base. In their analysis of 1,800 language minority students, Rosenthal et al.

pointed out that:

> language is not highly important in explaining level of achievement among the general population. Furthermore, the small influence on achievement level of language background is further reduced when socioeconomic status is controlled. Language background was found to have almost no influence on school-year learning. (p. 7)

Consequently, they concluded that socioeconomic status is much more closely related to achievement than is home language background.

The Rosenthal et al. paper opens an important debate over whether language background or socioeconomic (SES) is more crucial in explaining the low reading achievement of language minority students. Previous research on bilingual education has often tended to focus on language background at the expense of the SES variable. Also noteworthy is Rosenthal et al.'s utilization of a national data set to advance their assertion. Bilingual education researchers have tended to overlook large scale survey data to test their hypotheses.

In spite of the above merits, however, the Rosenthal et al. study falls short of its goals for a number of reasons. First, while the Sustaining Effects Study data base is a nationally representative study, it was not designed to study the issues of language minority students. Consequently, the Sustaining Effects Study specifically excluded non-English speaking students from its sample. Hoephner (1982) explained that any school with 50% or more limited-English speaking students and any classroom which had predominantly limited-English speaking students were excluded from the sample.

Second, the Sustaining Effects Study data base does not contain a strong measure of language minority status or level of English proficiency. The Rosenthal et al. study used a measure of language dominance derived from the question on whether English was used by a parent in providing homework assistance. This question is problematic in that (a) parents do not necessarily provide homework assistance; (b) parents may not have the ability to provide homework assistance; or (c)

homework assignments may be in English, which diminishes the likelihood of helping the child in a language other than English. Moreover, those 256 parents who failed to answer the homework question were arbitrarily grouped with 287 parents who reported helping in a language other than English. Since the Rosenthal et al. study did not properly measure the language variable, this may be the reason that the effect of language did not show up in the regression equation.

Third, the Rosenthal et al. study exaggerated the effects of the SES variable by including race. Since the SES variable generally does not include race as one of its categories, it is more appropriate to consider race as another control variable than to lump it together with the SES variable.

Finally, the Rosenthal et al. study did not examine the interaction effects between language background and socioeconomic status. Since a majority of language minority students are from low SES and Hispanic backgrounds, it is possible that a confounding effect among the above two variables could exist. Consequently, it may not be sufficient to study the effect of SES alone or the effect of language alone, but rather to study the statistical interactions between these two variables. The Rosenthal et al. study has pointed to a new research frontier but falls short of its goal.

The aim of this paper is to follow the promising thread of the Rosenthal et al. study in examining the intricate relationships among language background, SES, and ethnicity. In order to avoid some of the methodological errors in Rosenthal's study, this paper utilizes the High School and Beyond (HS&B) national data set which, among other things, was especially designed to collect data on issues facing language minority students. In what follows, this paper will describe the HS&B data base, discuss the variables used in the analysis, and then present and discuss the findings.

The Data Set

The High School and Beyond was a national longitudinal study of the cohorts of 1980 high school seniors and sophmores in the United States. The sample was a two-stage stratified probability sample with schools within a stratum drawn with a probability proportional to their size. Once a school was selected, up to 36 sophomores and 36 seniors were drawn randomly from the students enrolled in each selected school. All in all, about 58,000 students at 1,015 schools and school administrators from 988 schools completed questionnaires. The data set represents a population of 3.8 million sophomores and 3 million seniors in more than 21,000 schools in spring 1980 (Peng, Fetters & Kilstad, 1981; NORC, 1980a).

What makes the HS&B data base relevant to the present analysis is that special attention was paid to the collection of data on language minority populations (see Nielsen & Fernandez, 1981; So, 1982). If a student answered a non-English response to any or all of five language questions, that student was asked to complete another questionnaire concerning childhood language experiences, home language environment, pattern of other language usage, contact with bilingual education, etc. About 11,300 students answered the detailed language questions; their responses formed the language file of the HS&B data base (NORC, 1980b).

In addition to the special language questionnaire, the HS&B study also specifically over-sampled Hispanics, the largest language minority in the U.S. However, in order to avoid bias in over-sampling Hispanics, the HS&B assigned weights to each case in the sample. Weights were calculated to reflect differential probabilities of sample selection and to adjust for nonresponse. In this respect, the HS&B data set remains a nationally representative study that supplements the general information usually collected (e.g., family background, school experience, college aspirations, etc.) with information that is especially of interest to researchers in bilingual education.

Despite the fact that the HS&B data set is among the most comprehensive data base on language minority students, it also contains the following sample constraints which serve to weaken its use in our analysis. First, 8,267 students of the originally targeted 69,662 student sample were absent on the survey day (NORC, 1980a, p. 10). Since this represents 12% of the potential sample, it cannot be assumed that all of the students were absent because of illness or for family reasons. It is likely that a large proportion of the absentees were language minority students. If these assumptions are correct, then the HS&B data set excludes an unknown number of youngsters of language minority background. Second, many language minority students dropped out long before they reached the tenth grade, which means that the HS&B data set includes only those students who were talented or determined enough to survive through at least grade ten (Nielsen & Fernandez, 1981; Steinberg, Blinde & Chan, 1982). Third, due to the above filtering processes of absenteeism and dropping out, there is the conspicuous absence of non-English speaking language minorities in the HS&B data set. A simple fact is that if a student really was non-English speaking, that student had a high likelihood of dropping out before grade 10 and therefore was not present on the HS&B survey day. Consequently, when a student was asked for self-assessed English ability on the HS&B questionnaire, almost no one in the sample replied that he or she did not understand English. Indeed, one had to understand what was written on the English HS&B questionnaire at least well enough to circle the right answer "no English ability at all." Only 56 out of 58,000 students answered the questionnaire in Spanish.

Due to these three constraints, the data provided by the HS&B survey may have underestimated the low reading achievement of language minority students and may reduce the importance of the language background variable in explaining reading achievement. Therefore, in order not to further diminish the strength of the language variable in our analysis, it is very important to ensure that the language background variable be measured accurately.

The Variables

It is not an easy task to measure the language background variable accurately because too often the phrasing of the language question elicits a response that is unanticipated by survey researchers. For instance, the question, "What language do the people in your home usually speak?" is adequate for measuring home language usage, but the question by itself does not indicate whether a student uses that language at home or not. The presence of grandparents in the home greatly increases the usage of ethnic languages, but it does not mean that the student uses that language. Since the task here is to study the student's reading achievement on an individual level, the above home language question is not suitable for our research purpose.

On the other hand, the individual language question, "What language do you usually speak now?" is hard to answer if the context of using that language has not been specified. Since the HS&B survey was conducted in English and the high school environment is totally English, a student answering the above question is more likely to respond in English. Thus, it is not surprising that 86% of the sample in the language file identified English as their usual language. Since this individual language question cannot distinguish language minority from non-language minority students, this question is limited in its usefulness for measuring language background.

Because of the above complications, this paper aggregated several individual language questions that specify the context of language usage at home (speak that language to mother) and outside the home (speak that language with best friends, with other students, at work and in stores). The responses to these questions enable us to construct a three category language status variable as follows:

- English Monolingual--if a student never used a non-English language at home or outside the home.
- English Dominant Bilingual--if a student used a non-English language at home only but never used it outside the home.
- Other Language Dominant Bilingual--if a student used a non-English language at home and outside the home.

There is no other language monolingual category in the HS&B sample due to the sample constraints explained earlier.

Once the definitional problem of language minority status is settled, the measurement of SES, ethnicity, and reading achievement variables can also be defined in the HS&B data set. The HS&B data set has provided a standard socioeconomic status (SES) variable which is a composite scale constructed from father's occupation, father's education, mother's education, family income, and a set of items that ask whether the student's family receives a daily newspaper, owns an encyclopedia or other reference books, has a typewriter, an electric dishwasher, two or more cars or trucks, more than 50 books, or a pocket calculator, and whether the student has his or her own room. Each item of the SES scale was standardized within a grade to a mean of zero and a standard deviation of one. The mean of the non-missing items was then taken for each case to yield the composite SES measure.

The ethnicity variable is taken from responses to the question, "What is your origin or descent?" Students are Hispanic if their ancestry was originally from Latin American countries, and students are White if their ancestry was originally from European countries. This paper includes only Whites and Hispanics for the analysis.

Finally, reading achievement is measured by scores on the reading test in the student questionnaire. The reading test score variable is standardized across grades to have a mean of 50 and a standard deviation of 10 for the entire HS&B test-taking sample. In this paper, the original HS&B reading test scores were then multiplied by two, thus yielding a mean of 100 and a standard deviation of about 20. Such an alteration does not change the relative value of the reading scores and allows easier interpretation.

To recall, the primary research question addressed in this paper is which factor(s) account for the low reading achievement scores of language minority students. Regression analysis provides the best method for answering this question.

The Regression Model

The coefficients in a regression equation[1] will show the effect of a one-unit increase of an independent variable on the dependent variable after controlling for the effects of other independent variables in the regression equation. In this paper, the dependent variable is the reading achievement test scores, and the independent variables are language backgrounds, SES, and the interaction terms between these two variables. Since language background is a nominal variable, the dummy variable regression technique described in the Statistical Package for Social Sciences (SPSS) computer program can be performed on them. We ran two sets of regression equations: One for the white, another for the Hispanic students.

The means, standard deviations, and the correlation matrix used to compute the regression coefficients are presented in the Appendix. The interpretation of the regression coefficients will be given in the next section.

The Findings

Table 1 presents the regression equation for each ethnic group. For white students, the coefficient (-9.73) for the other-language dominant bilingual variable means that when the effects of all other independent variables were controlled, bilingual white students scored

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[1] Because of the suspected interaction terms between SES and language status, it is inappropriate to examine the increment of R^2 by each variable entered into the regression equation as a measure of the unique importance of that variable. As Bowles and Levin (1971) explain, the shared portion of variance in achievement which could be accounted for by either X_1 or X_2 will always be attributed to that variable which is entered into the regression equation first. In this aspect, it is more appropriate to examine the regression coefficients in the equation than to examine the addition of the proportion of variance.

9.73 points lower in reading achievement tests than the English monolingual white sudents. Similiarly, the Spanish-dominant Hispanic students scored about 8.96 points lower than the English monolingual Hispanic students. When we turn our attention to the coefficient of socioeconomic status (SES), we find that SES also has a fairly strong independent effect on reading achievement, although its impact is stronger on white (3.85) than on Hispanic students (3.21). In sum, the regression coefficients in Table 1 point to the fact that each of our independent variables (SES and language background) contributes uniquely to the explanation of the reading achievement variable.

Table 1. The Regression Equations for Reading Score*

I. For White Students (R^2 = 0.08)

Reading = 105.86 + 6.85 (SES) - 1.17 (ENG Dom) - 9.73 (OTH Dom)
-2.75 (SES.OTH) - 0.20 (SES.ENG)
English Monolinguals: Reading = 105.9 + 6.9 (SES)
English-Dominant Bilinguals: Reading = 104.7 + 6.7 (SES)
Other-Dominant Bilinguals: Reading = 96.1 + 4.1 (SES)

II. For Hispanic Students (R^2 = 0.09)

Reading = 97.80 + 3.21 (SES) + 0.51 (ENG DOM) - 8.96 (OTH DOM)
-1.26 (SES.OTH) + 4.07 (SES.ENG)
English Monolinguals: Reading = 97.8 + 3.2 (SES)
English-Dominant Bilinguals: Reading = 98.3 + 7.3 (SES)
Other-Dominant Bilinguals: Reading = 88.9 + 2.0 (SES)

*All the regression coefficients in this table are twice their standard errors. Significance tests had been performed on both the white and Hispanic groups. This was done by using the coefficients from the weighted sample and using the degree of freedom from the unweighted sample (see Coleman, 1981). It was found out that the interaction terms (in SES.OTH, SES.ENG) were not significant at 0.01 level for the white group but were significant for the Hispanic group.

Table 1 also reports the interaction terms among the independent variables. Although the interaction terms are less than the coefficients of the independent variables, they are statistically significant at 0.05 level and their sizes are not negligible. As such, the contributions of these interaction terms have to be taken into account in calculating the predicted reading achievement scores from the regression equation.

Table 2 presents the predicted reading achievement scores for each ethnic group. Columns 4 and 8 in Table 2 report the impact of language background on reading achievement after the effects of ethnicity and SES have been controlled. These two columns show that language background has a consistent effect on reading achievement for each SES and ethnic group. On the other hand, row 12 in Table 2 shows the impact of SES on reading achievement after the effects of ethnicity and language have been eliminated. Row 12 reveals the interesting interaction effects among the three independent variables. In general, the impact of SES on reading achievement was stronger for Whites than for Hispanics, and stronger for English monolinguals than for Other-language dominant bilingual. But for the medium SES Hispanic students, there is an interaction effect in which the SES factor proves to be very important in explaining reading achievement.

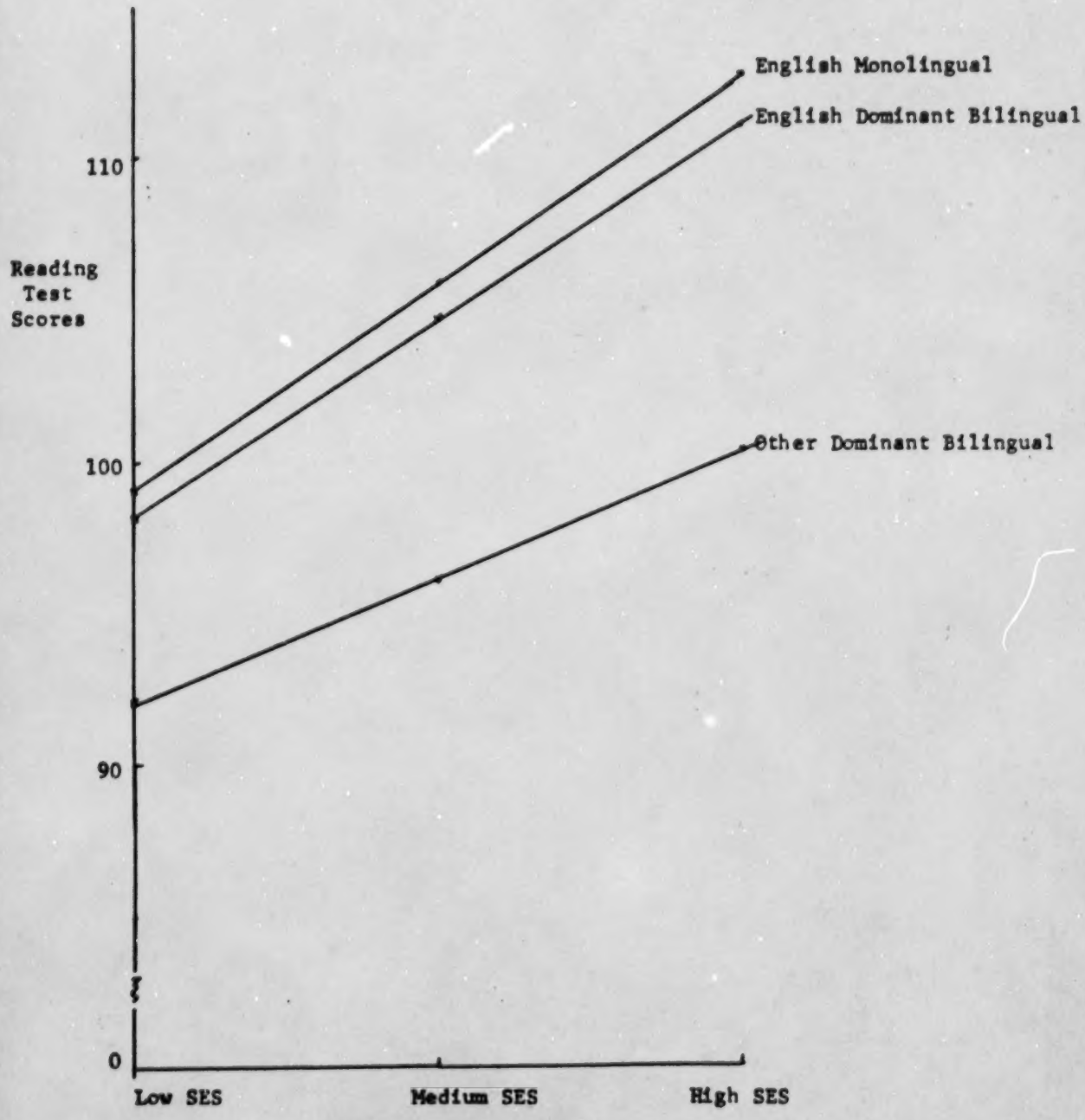
These interaction effects can further be shown by plotting the figures in Table 2 in Graphs 1 and 2. The slope of the lines in Graphs 1 and 2 illustrate the interaction effect vividly. Comparing these graphs, we find that the slopes for the White students are steeper than those for the Hispanic students, suggesting that SES has more of an impact on White students than on Hispanic students. However, for the English-dominant Hispanic bilingual students, the medium SES and high SES groups more readily convert their SES advantages into reading achievement than do their English monolingual Hispanic peers. This suggests that for high SES Hispanics, there may be educational advantages to being bilingual.

Table 2. Predicted Reading Test Scores from the Regression Equation

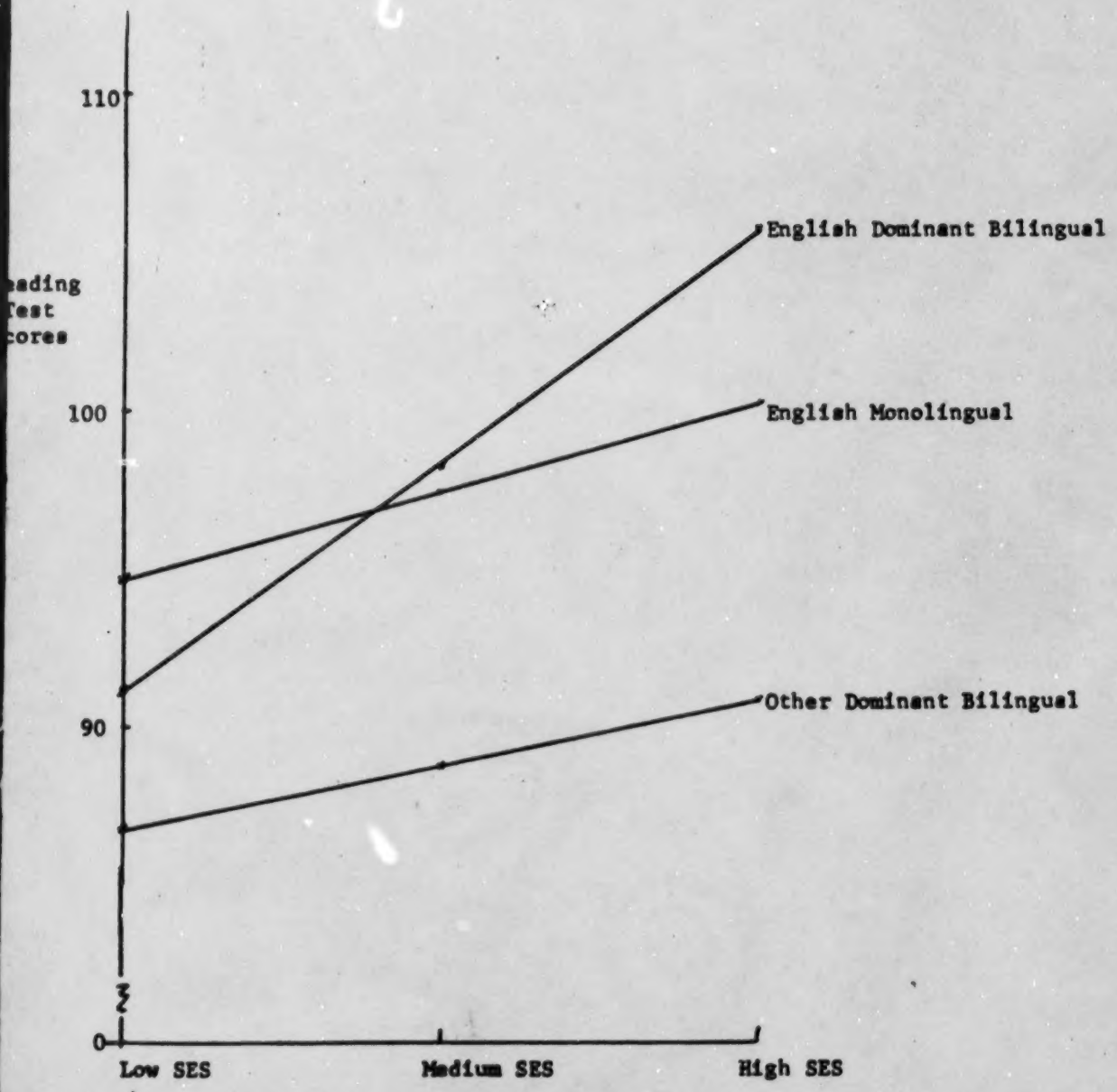
		White				Hispanic			
		Eng Mono (1)	Eng Dom (2)	Other Lang Dom (3)	Difference (4)=(1)-(3)	Eng Mono (5)	Eng Dom (6)	Other Lang Dom (7)	Difference (8)=(5)-(7)
Socioeconomic status*									
High	(9)	112.7	111.3	100.2	(12.5)	100.0	105.6	90.8	(9.2)
Medium	(10)	105.9	104.7	96.1	(9.8)	97.8	98.3	88.9	(8.9)
Low	(11)	99.0	98.0	92.0	(7.0)	94.6	91.0	86.9	(7.7)
Difference	(12)=(9)-(11)	(13.7)	(13.3)	(8.2)	--	(5.4)	(14.6)	(3.9)	--

*We used a continuous SES variable which has a mean of 0 and a standard deviation of 1. The high, medium, low SES categories are calculated by assigning 1, 0, -1 to the SES variable in the regression equation.

Graph 1. Reading Test Scores of White Students.



Graph 2. Reading Test Scores of Hispanic Students.



The gaps between the lines in Graphs 1 and 2 present the differences of reading achievement scores between English-monolinguals and Other-language dominant bilingual students, even when the effect of ethnicity and SES have been controlled. This gap shows the disadvantages to reading achievement facing language minority students; it is about 9 points on the reading achievement test for Hispanics and about 10 points for White language minority students.

Further Analyses on the Reading Achievement Gap

To elaborate on this reading achievement gap concept, a different statistical technique can be applied to the data. In the following analyses, we are interested in knowing how much the reading achievement gap between English monolingual and Other-language dominant bilingual students would be reduced if the effect of SES was removed? In other words, what would be accomplished if we hypothetically eliminate the language minority student's handicap with respect to the economic level of the family, but their disadvantages with respect to language background and ethnicity remained intact.

It is inappropriate to use the increment of the variance explained (R^2) to provide answers to the above question because of the correlation between socioeconomic status and language background (see Bowles & Lewis, 1971). Consequently, we rely on the statistical method generated by Duncan (1969). The findings in Graph 3 are a replication of Duncan's method for removing the effect of SES from their compound

effects with language background.[2] Graph 3 shows that removing the effects of SES would hypothetically reduce the reading achievement gap by 3.9 points out of a total of 15 points.

Furthermore, since we are now examining the white and Hispanic students together, we can suppose that if we eliminated the effects of SES and ethnicity, how much more would the reading achievement gap be reduced? Such an intervention, accomplished hypothetically by simple mathematics, would further reduce the reading achievement gap by another 3.6 points.

Following the above logic, suppose a group of language minority students have the same SES and ethnic status as their English monolingual peers. The reading achievement gap between the two groups would be reduced, but there would still be 7.5 points difference separating the two groups. In other words, 7.5 points out of the original reading achievement gap of 15 points, or 50% of the difference, are still unexplained, even after we remove the effects of SES and ethnicity from the regression equation.

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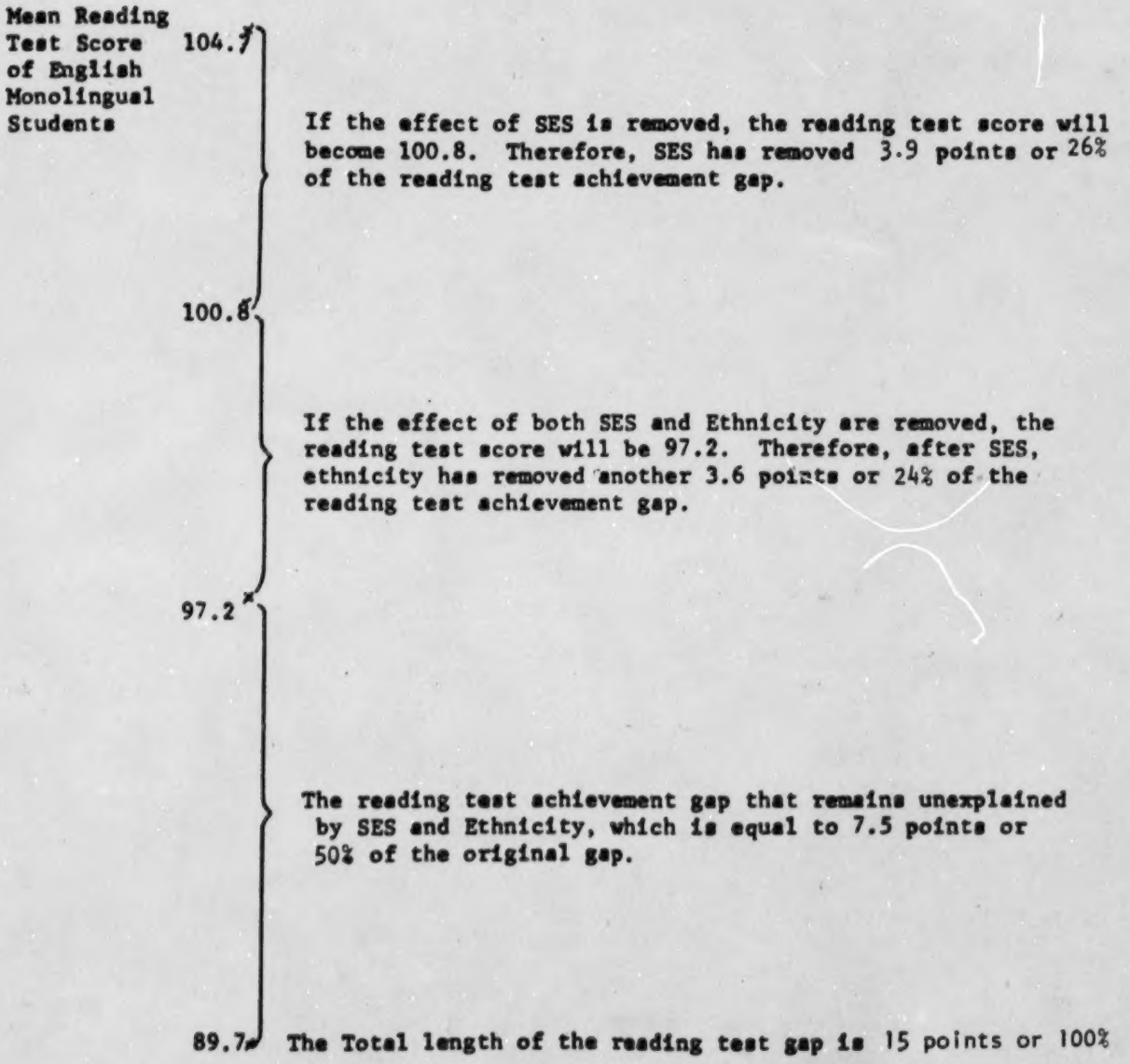
[2]The computation of the figures are like this: for the English monolingual sample, compute the regression of reading scores on SES only. Having computed the regression coefficients, substitute the other language dominant bilingual means on the SES into the regression equation for English monolingual students. This yields a calculated value of 100.8, shown as the second figure in the chart in Graph 3. In effect, the question answered by this calculation is this: suppose a selected group of English monolingual students have SES scores equal to the average scores for all Other language bilingual students, what would be our best estimate of their reading test score? The calculation assumes that the remaining variables in the regression operate in the fashion observed for English monolingual. Similarly, the second calculation utilizes the English monolingual regression of reading scores on SES and ethnicity; Other language dominant bilingual means on these two variables are substituted into the English monolingual equation to produce the estimate of 97.2 reading test score in Graph 3.

Graph 3. How would the removal of the effects of SES and Ethnicity reduce the reading test achievement gap between English Monolingual and Other-Language Dominant Bilingual Students?


Mean Reading Test Score of English Monolingual Students
104.7
If the effect of SES is removed, the reading test score will become 100.8. Therefore, SES has removed 3.9 points or 26% of the reading test achievement gap.
100.8
If the effect of both SES and Ethnicity are removed, the reading test score will be 97.2. Therefore, after SES, ethnicity has removed another 3.6 points or 24% of the reading test achievement gap.
97.2
The reading test achievement gap that remains unexplained by SES and Ethnicity, which is equal to 7.5 points or 50% of the original gap.
89.7
The Total length of the reading test gap is 15 points or 100%

The regression equations for the above calculation are as follows:

For English Mono, Reading=104.5 + 6.97 (SES)

Reading=105.93 + 6.15 (SES) —7.44 (Ethnic)

The Means for the substition are:

For English Mono, Reading=104.7, SES=0.04, Ethnic=0.20

For Other Lang Dominant Bilingual,

Reading=89.7, SES=-0.53, Ethnic=0.73

Discussion and Conclusions

This paper initially asked whether language background or SES is more important in explaining the reading achievement level of language minority students. The findings here reveal that both language background and SES have a substantial impact on reading achievement scores. This is not surprising since the bilingual education literature has long argued that immersion of language minority children in a language environment alien to their own language background will depress their subsequent educational achievement. Moreover, sociological studies suggest that children from a low socioeconomic background are deprived of certain cultural advantages such as owning books, reading scientific journals, or possessing a calculator, which can promote educational achievement.

Our analyses explore the interaction terms between language background, SES, and ethnicity. The results support the notion that since a majority of language minority students are from low SES and ethnic minority backgrounds, a confounding effect among these three variables could exist. Consquently, it was found that SES had more of an impact on white than on Hispanic students. This result supports Carter's (1970) observation that the influence of family economic level is greater for Anglo than for Mexican-American pupils. What this interesting result suggests is that the major obstacle facing the reading achievement of white students is their socioeconomic background, and raising the SES of the white students may help them overcome their language handicaps (see, for instance, Bernstein, 1961). But for Hispanic language minority students, raising their SES background may not improve their reading achievement because they are faced with other obstacles besides low SES.

To further analyze the reading achievement gap between students who are language minorities and those who are not, this paper utilized Duncan's regression method to remove the effects of SES and ethnicity. It was found out that there was a reading achievement gap of 15 points between the two groups. These 15 points were partly explained by the

unique contribution of the SES variable, while another portion was attributed to the interactions among language, SES, and ethnicity. But even when we removed the effects of SES and ethnicity, we had accounted for only about 7.5 points (50%) of the original reading achievement gap of 15 points. Therefore, the remaining unexplained 7.5 point difference has to be explained by language and other variables. In this respect, it could be asserted that language minority students are at a 15 point disadvantage in reading achievement when no effort is made to raise their SES and ethnic status. That disadvantage for language minority students remains at about 7.5 points even when the effects of SES and ethnicity are controlled.

Since all students, including language minority students, are entitled to receive a quality education, it is important to provide programs that specifically address their language needs in order to reduce the reading achievement gap between language minority students and non-language minority students. As this paper demonstrates, efforts which are directed only to raising the SES and ethnic status of language minority students will not provide an adequate solution to the problem; it seems that the problems of language minority students can best be solved by programs that are specifically designed to eliminate their language differences.

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Appendix: Means, Standard Deviations, and Correlations*

	Reading	SES	Eng Dom	Oth Dom	SES.Eng	SES.oth	$\bar{X}$	S.D.
Reading	--	.248	.031	-.155	.171	.052	105	19
SES	.222	--	.082	-.060	.678	.338	.137	.728
Eng Dom	.108	.035	--	-.276	.204	-.001	.419	.493
Other Dom	-.205	-.196	-.693	--	-.056	.002	.096	.294
SES.Eng	.121	.589	-.464	.322	--	-.000	.087	.502
SES.oth	.167	.552	.455	-.656	-.211	--	.000	.246
$\bar{X}$	92	-.537	.462	.359	-.235	-.260	--	--
S.D.	18	.711	.499	.480	.548	.529	--	--

*The coefficients for the white are in the upper diagonal, while those for the Hispanic are in the lower diagonal.